

U.S. DEPARTMENT OF ENERGY  
FIELD TASK PROPOSAL/AGREEMENT

## FIELD TASK PROPOSAL/AGREEMENT

7. TASK TITLE  
Continuing Marshall Islands Radiological Dose Assessment

11. CONTRACTOR NAME	12. CODE
UNIV. OF CALIFORNIA	
LAWRENCE LIVERMORE	WZJ
LABORATORY	

W. Robison

☐ YES  
☒ NO

The radiological consequences of resettling atolls in the Northern Marshall Islands will be assessed. Doses will be calculated for each exposure pathway and for several alternate living patterns for the various atolls. Special attention will be given to Bikini and Enewetak Atolls.

Data from the surveys, latest results from continuing research programs, and updated information on diet and alternate living patterns will be used with the latest dose models to calculate bone and whole body doses via ingestion and inhalation. Doses from all pathways, including external exposure, will be summed to determine the predicted maximum annual dose rates and the integrated 30-, 50-, and 70-year doses to populations resettling the atolls.

3-13-80  
(Date)

☐ a. Facility Requirements    ☒ d. Background    ☒ g. Future accomplishments    ☐ j. Explanation of milestones

☒ b. Publications    ☒ e. Approach    ☒ h. Relationships to other projects    ☒ k. Other (specify):

☒ c. Purpose    ☒ f. Technical progress    ☐ i. Environmental assessment

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TASK REQUIREMENTS FOR OPERATING/EQUIPMENT  
COSTS AND OBLIGATIONS

CONTRACTOR NAME

UNIVERSITY OF CALIFORNIA  
LAWRENCE LIVERMORE LABORATORY

BIN NUMBER

TASK NO.	REV. NO.	DATE PREPARED
	0	03-03-80

CONTRACTOR NUMBER  
LLL/EV-82- 22  
EV RPIS #600146

20. STAFFING (*in staff yrs*)

	BY-2	PRESIDENT'S	BY-1 REVISED	AUTHORIZED	BY-FY 1982
a. SCIENTIFIC . . . . .	3.8	3.8	3.8		3.8
b. OTHER DIRECT . . . . .	0.9	0.9	0.9		0.9
c. TOTAL DIRECT . . . . .	4.7	4.7	4.7		4.7

21. OBLIGATIONS AND COSTS  
(*in thousands*)

	BY-2	PRESIDENT'S	BY-1 REVISED	AUTHORIZED	BY-FY 1982
a. TOTAL COSTS . . . . .	400	440	440		490
b. TOTAL OBLIGATIONS . . . . .	400	440	440		490

22. EQUIPMENT (*in Thousands*)

	BY-2	PRESIDENT'S	BY-1 REVISED	AUTHORIZED	BY-FY 1982
a. EQUIPMENT COSTS . . . . .	38	20	30		30
b. EQUIPMENT OBLIGATIONS . . . . .	38	20	30		30

23. OTHER COSTS (*specify*)

a.  
b.  
c.  
d.

24. OPTIONAL FIVE-YEAR PLAN

Constant BY dollars

BY +1	BY +2	BY +3	BY +4
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a. TOTAL OPERATING COSTS . . . . .				
b. TOTAL OPERATING OBLIGATIONS . . . . .				
c. TOTAL EQUIPMENT COSTS . . . . .				
d. TOTAL EQUIPMENT OBLIGATIONS . . . . .				

25. MILESTONE SCHEDULE

PROPOSED SCHEDULE

AUTHORIZED SCHEDULE

5010690



## 19. DETAIL ATTACHMENTS

This is a continuing project.

## a. Facility Requirements

Not applicable.

## b. Publications

Fiscal Year 1979

1. W.L. Robison, V.E. Noshkin, and W.A. Phillips, Assessments of Potential Doses to Populations from the Transuranic Radionuclides at Enewetak Atoll, Lawrence Livermore Laboratory, Livermore, CA, UCRL-52666 (1978).

Fiscal Year 1980 - First Quarter

2. W.L. Robison, W.A. Phillips, M.E. Mount, B.R. Clegg, and C.L. Conrado, Preliminary Reassessment of the Potential Radiological Doses for Residents Resettling Enewetak Atoll, Lawrence Livermore Laboratory, Livermore, CA, UCID-18219 (1979).

## c. Purpose

Weapons testing in the Marshall Islands has resulted in residual radiological contamination on some atolls. The objective of this program is to assess radiological doses at Bikini, Enewetak, and other northern Marshall Islands atolls for each exposure pathway for alternate living patterns. These assessments will provide a basis for decisions on resettlement options.

## d. Background

From 1947 through 1958 the evacuated Enewetak and Bikini Atolls in the northern Marshall Islands served as the U.S. nuclear proving grounds. In 1969 a limited clean-up and an initial phase of housing construction was begun at Bikini Atoll with the subsequent return of some of the Bikini people to Bikini Island. In 1972, the Enewetak people requested that they be allowed to return to Enewetak Atoll; a major survey and assessment program was undertaken to evaluate the radiological consequences of such resettlement. The conclusions were that the northern half of Enewetak Atoll was not suitable for resettlement and that terrestrial food chains were potentially the most critical radiological dose pathway. In 1975 during evaluation of plans for a second phase of housing construction on Bikini Atoll, it was decided that a more detailed survey of Bikini and Eneu Islands was needed. The results of this survey indicated that people residing on Bikini Atoll would receive doses exceeding the U.S.

5010691

federal guidelines (1). The apparent conflict between the restrictions indicated by this outcome and the strong desire of the people to resettle Bikini and Eneu Islands has created the need for more detailed and refined assessments addressing options at both atolls.

It was also decided that prior to the end of the Trust Territory Agreement the U.S. should evaluate the radiological conditions of all of the northern Marshall Islands Atolls downwind of the Pacific proving grounds. The field program was conducted from September through November 1978. Assessing the very large body of data produced will take the next two years.

#### Reference

1. W.L. Robison, W.A. Phillips, and C.S. Colster, Dose Assessment at Bikini Atoll, Lawrence Livermore Laboratory, Livermore, Calif., UCRL-51879.5 (1977).

#### e. Approach

A data bank of radionuclide concentrations developed from continuing research and survey programs will be maintained. These data will be used in conjunction with models for predicting doses to bone, lung, and whole body from  $^{137}\text{Cs}$ ,  $^{90}\text{Sr}$ ,  $^{241}\text{Am}$ ,  $^{239+240}\text{Pu}$ , and other selected radionuclides.

As an example, the latest lung model from the International Commission on Radiological Protection is used to develop dose estimates to lung and bone via the inhalation pathway. Whole body  $^{137}\text{Cs}$  dose calculations are based on the two-component retention models developed by the ICRP for  $^{137}\text{Cs}$  body burdens. The most recent publications by Spiers, et al. (2) on  $^{90}\text{Sr}$  distribution in bone are used to predict bone doses from  $^{90}\text{Sr}$ .

In addition, information on diet and land use associated with alternate living patterns will be developed for each atoll under consideration to complete the dose assessments.

#### Reference

2. A Report of the United Nations Scientific Committee on the Effects of Atomic Radiation to the General Assembly, Ionizing Radiation: Levels and Effect (United Nations, New York, 1972) pp 50.

## f. Technical Progress

## Fiscal Year 1979

A preliminary reassessment of the potential doses to a population living on Eneu and Bikini Islands was completed. It included evaluation of external gamma exposure using recent data obtained in the Multi-Atoll Survey, evaluation of the terrestrial food-chain using data recently developed from the Eneu test plots, evaluation of the inhalation doses, and reevaluation of the marine food-chain. Annual doses predicted for Eneu Island are less than the 500 mrem per year federal guidance; predicted doses for Bikini Island are twice that recommended in the guidelines when imported foods are available and four times that recommended when imported foods are unavailable.

A complete reassessment of the radiological situation of Enjebi Island at Enewetak Atoll was made and will form the basis for decisions concerning immediate and longer-range use of this major residence island. The assessment included evaluating doses from all exposure pathways for  $^{90}\text{Sr}$ ,  $^{137}\text{Cs}$ ,  $^{239+240}\text{Pu}$ , and  $^{241}\text{Am}$ . Average bone marrow and whole body doses for Enjebi Island if imported foods are available are about half the federal guidance of 500 mrem per year; if imported foods are unavailable the predicted doses are right at federal guidance. Predicted doses for living patterns on other islands at Enewetak Atoll are less than those predicted for Enjebi Island.

## Fiscal year 1980

An assessment of the northern half of Enewetak Atoll will be completed. This will include evaluating alternate living patterns using the northern islands and evaluating use of coconuts planted on the northern islands.

A dose assessment of the marine pathway will be completed for 13 atolls and islands visited during the survey. Also an evaluation of groundwater and drinking water will be completed on those atolls where samples were obtained.

We will give top priority to processing and analyzing samples from Bikini and Rongelap Atolls. Data from both atolls will be available during this year to complete the radiological dose assessments, including all exposure pathways for all radionuclides. The Bikini assessment will also include alternate living patterns involving Eneu and Bikini Islands.

We will continue to develop the Marshall Islands data bank and add new data from the ongoing environmental research projects. A part of this effort will include formatting the data base such that data from other DOE studies in the Marshall Islands may be included at some future time.

5010693

#### Fiscal Year 1981

Assessments of all atolls surveyed in the Multi-Atoll Survey will be completed during this year. Uterik Atoll will be addressed on a priority basis with the assessment being published as soon as possible.

Enewetak Atoll will also be considered on a separate basis because of the unique nature of the atoll. Further assessments will be conducted to evaluate alternate living patterns at the atoll and the potential use of crops for commercial purposes. It is anticipated that assessments of the other atolls will probably be reported in a single document.

Although they cannot be precisely identified at the present time, requests from DOE and other agencies for additional radiological assessments of the Marshall Islands are anticipated. The necessary data bases and expertise will be maintained to facilitate response.

#### Fiscal Year 1982

Continuing assessments will probably be required at both Bikini and Enewetak Atolls. The need for additional assessments of other atolls or other Marshall Islands situations will undoubtedly occur in the future. Although these needs cannot yet be precisely identified, we will maintain the necessary data bases and expertise to respond and develop assessments.

#### g. Future Accomplishments

The radiological dose assessments developed in this activity will provide a basis for decisions on resettlement options at Bikini, Enewetak, Rongelap, and other atolls in the northern Marshall Islands.

#### h. Relationships to Other Projects

This project is very closely related to, and in fact depends on, other projects such as "The Northern Marshall Islands Multi-Atoll Survey," (5120.2 No. LLL/EV-82-13, "Marshall Islands Radioecology Studies for Dose Assessment," (5120.2 No. LLL/EV-82-22), "Biogeochemical Cycling of the Transuranics and Other Radionuclides in the Marshall Islands," (5120.2 No. LLL/EV-82-35), and the ongoing DOE support of the Enewetak Radiological Clean-up Program.

#### i. Environmental Assessment

Not applicable.

#### j. Explanation of Milestones

Not applicable.

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k. Equipment

	Estimated Cost	
	FY 1981	FY 1982
Desk top computer, Hewlett Packard 9830	\$30,000	\$30,000
TOTAL	\$30,000	\$30,000

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5010696



DOE Form 5120.2  
(12-78)

U.S. DEPARTMENT OF ENERGY  
FIELD TASK PROPOSAL/AGREEMENT

1. WP BIN NUMBER 2. TASK NO. 3. REV. NO. 0 4. PROJECT NO. 5. DATE PREPARED (mm dd yy) 03-03-80 6. CONTRACTOR NUMBER LLL/EV-82-23 EV RPIS # 67035600  
7. TASK TITLE  
Marshall Islands Data Bank  
8. WORK PACKAGE TITLE  
WP-82-11  
9. BUDGET AND REPORTING CODE HA-02-01-02-0 10. TASK TERM  
Begin: 10/01/80 End: Open 11. CONTRACTOR NAME UNIV. OF CALIFORNIA LAWRENCE LIVERMORE LABORATORY WZJ  
13. CONTRACTOR TASK MANAGER (Name, FTS No.) MORTIMER L. MENDELSON, 532-5758 14. PRINCIPAL INVESTIGATORS W. Robison

15. WORK LOCATION:

LAWRENCE LIVERMORE LABORATORY  
UNIVERSITY OF CALIFORNIA  
LIVERMORE, CALIFORNIA 94550

16. Does this task include any management services efforts:  
☐ YES  
☒ NO

17. TASK DESCRIPTION (Approach, relation to work package, in 200 words or less)

An existing data bank at LLL will be expanded to include all available data related to radiological evaluations of the Marshall Islands. Included will be external gamma measurements, radionuclide concentrations (soil, vegetation, animal, water, and air), and environmental parameters (rainfall, evaporation rate, soil moisture, windspeed, etc.). All available data taken before, during, and after the testing period will be included. Indicative data for retrieval will include radionuclide, location, data source, sample type, analytical method, and date. Also being considered for inclusion is human radiological data (e.g., whole-body counting data).

The objective is to have a single data management system from which the total body of radiological and related data gathered and to be gathered over the years will be readily accessible. This will facilitate present and future evaluation and assessments related to radiological condition in the Marshall Islands environment.

This task is closely related to the tasks, "Continuing Marshall Islands Dose Assessments" 5120.2 No. LLL/EV-82-22, "Northern Marshall Islands Multi-Atoll Survey", 5120.2 No. LLL/EV-82-13, "Marshall Islands Radioecology Studies for Dose Evaluation", 5120.2 No. LLL/EV-82-46, and "Biogeochemical Cycling of Transuranics and Other Radionuclides in the Marshall Islands", 5120.2 No. LLL/EV-82-35. All data from the latter three tasks are being entered in an existing LLL data bank for use in conducting the assessments and evaluation required in the first task.

18. CONTRACTOR TASK MANAGER

Mortimer L. Mendelson  
(Signature)

3-15-80  
(Date)

19. DETAIL ATTACHMENTS: (See instructions)

☐ a. Facility Requirements ☒ d. Background ☒ g. Future accomplishments ☐ j. Explanation of milestones  
☐ b. Publications ☒ e. Approach ☒ h. Relationships to other projects ☐ k. Other (specify):  
☒ c. Purpose ☒ f. Technical progress ☐ i. Environmental assessment

5010697

TASK REQUIREMENTS FOR OPERATING/EQUIPMENT  
COSTS AND OBLIGATIONS

CONTRACTOR NAME

UNIVERSITY OF CALIFORNIA  
LAWRENCE LIVERMORE LABORATORY

BIN NUMBER

TASK NO.	REV. NO.	DATE PREPARED
	0	03-03-80

CONTRACTOR NUMBER  
LLL/EV-82- 23  
EV RPIS #

20. STAFFING ( <i>in staff yrs</i> )	BY-2	BY-1 PRESIDENT'S	REVISED	AUTHORIZED	BY-FY 1982
a. SCIENTIFIC . . . . .	0	0	3.2		2.9
b. OTHER DIRECT . . . . .	0	0	0.8		0.7
c. TOTAL DIRECT . . . . .	0	0	4.0		3.6
21. OBLIGATIONS AND COSTS ( <i>in thousands</i> )					
a. TOTAL COSTS . . . . .	0	0	375		375
b. TOTAL OBLIGATIONS . . . . .	0	0	375		375
22. EQUIPMENT ( <i>in Thousands</i> )					
a. EQUIPMENT COSTS . . . . .	0	0	0		0
b. EQUIPMENT OBLIGATIONS . . . . .	0	0	0		0
23. OTHER COSTS ( <i>specify</i> )					
a.					
b.					
c.					
d.					
24. OPTIONAL FIVE-YEAR PLAN		BY +1	BY +2	BY +3	BY +4
Constant BY dollars					
a. TOTAL OPERATING COSTS . . . . .					
b. TOTAL OPERATING OBLIGATIONS . . . . .					
c. TOTAL EQUIPMENT COSTS . . . . .					
d. TOTAL EQUIPMENT OBLIGATIONS . . . . .					
25. MILESTONE SCHEDULE		PROPOSED SCHEDULE		AUTHORIZED SCHEDULE	

5010698

## 19. DETAIL ATTACHMENTS

This is a new project.

## a. Facility Requirements

Not applicable.

## b. Publications

Not applicable.

## c. Purpose

The purpose of this task is to compile and store in a centralized data bank all available radiological and related data obtained in the Marshall Islands before, during, and after the U.S. nuclear testing program. This will facilitate and expedite assessment activities that heretofore were impossible or required inordinate efforts to compile pertinent information.

## d. Background

From 1947 through 1958 nuclear tests were conducted by the U.S. at Enewetak and Bikini Atolls in the Northern Marshall Islands after inhabitants were evacuated. In 1969, a limited clean-up and an initial phase of housing construction was begun at Bikini Atoll, with some Bikini people resettled on Bikini Island. In 1972, the Enewetak people requested that they be allowed to return to Enewetak Atoll; a major survey and assessment program was undertaken to evaluate the radiological consequences of such a resettlement. The general conclusions were that the northern half of Enewetak Atoll was not suitable for resettlement and that terrestrial food chains were potentially the most critical radiological dose pathway. In 1975, in evaluating plans to start a second phase of housing construction on Bikini Atoll, it was decided to first conduct a more detailed survey of Bikini and Eneu Islands. The results of this survey indicated that people residing on Bikini Atoll would receive doses exceeding the U.S. federal guidelines (1). The apparent conflict between recommendations dictated by these assessments and the desire of the Bikini people to resettle Bikini and Eneu Islands point out the need for more detailed and refined assessments of both islands.

In 1978, the decision was made that before the end of the Trust Territory Agreement the U.S. should evaluate the radiological conditions of all of the northern Marshall Islands Atolls downwind of the Pacific Proving Grounds. The field study, conducted from September 1978 through November 1979, and subsequent analyses of collected samples have produced the very large body of data needed for the radiological assessments.

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In addition, various studies have been conducted in the area by other groups; however, no attempt has ever been made to gather all of the available information into one data management system where it would be readily available and accessible for assessment activities.

e. Approach

Each sample is assigned an ID number in the sample processing laboratory. Using this ID as a key, two files are created. The first is a cross reference file that links the sample with descriptive material such as soil-profile increment, species, etc. The second file contains the analytical data from the counting laboratories.

Sample data may be from other than current surveys and programs. Published data not available on tape or cards will be key-punched and entered into the system manually.

After files are created, a Livermore data base system (1) is used to access any desired sample information. Data may be retrieved by location, date, type or any combination derived from these or other attributes stored in the cross reference file.

References

1. S.E. Jones and D.R. Rices, A Relational Data Base Management System for Scientific Data, Lawrence Livermore Laboratory, Livermore, Calif., UCRL-80769 (1978).

f. Technical Progress

Fiscal Year 1980

New project; program outlined to begin in 1981 could begin in 1980 if funding were available.

Fiscal Year 1981

A data bank has been developed for our continuing studies at both Enewetak and Bikini Atolls. In addition, the data obtained from the Multi-Atoll Survey is being incorporated into this data management system. This system will serve as the basis for incorporating all previous and future data from the Marshall Islands.

We would like to begin this year to expand and develop the refinements in our current data management system so it can handle all types of available Marshall Islands radiological data. In addition, we will make contact with the University of Washington, Brookhaven, and DOE/NVVO to organize historical data into the data

management system. We will also establish procedures to incorporate all current and future data from DOE-funded programs in the Marshall Islands.

#### Fiscal Year 1982

The data management system will be expanded and refined, and data from various laboratories, universities, etc., will be added. We will also be adding data from our ongoing programs. We will supply data from this system as needed by DOE.

#### g. Future Accomplishments

We will continue to incorporate all data obtained in the Marshall Islands into the data bank. This data bank will provide the information for the radiological dose assessments that will serve as the basis for the U.S. government (DOE, DOI, DOD) to make decisions on resettlement options at Bikini, Enewetak, Rongelap, and other atolls in the northern Marshall Islands.

#### h. Relationships to Other Projects

This program is very closely related, and in fact depends on, other programs such as "Northern Marshall Islands Multi-Atoll Survey", 5120.2 No. LLL/EV-82-13, "Marshall Islands Radioecology Studies for Dose Evaluation", 5120.2 No. EV/82-46, "Biogeochemical Cycling of Transuranics and Other Radionuclides in the Marshall Islands", 5120.2 No. LLL/EV-82-35, ongoing DOE Support of the Enewetak Radiological Clean-up Program, current programs at Brookhaven National Laboratory (BNL), and historical programs at the University of Washington and at BNL.

#### i. Environmental Assessment

Not applicable.

#### j. Explanation of Milestones

Not applicable.

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